

HORYU-IV – Arc Event Generator and Investigation Satellite

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HORYU4

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Mission statement

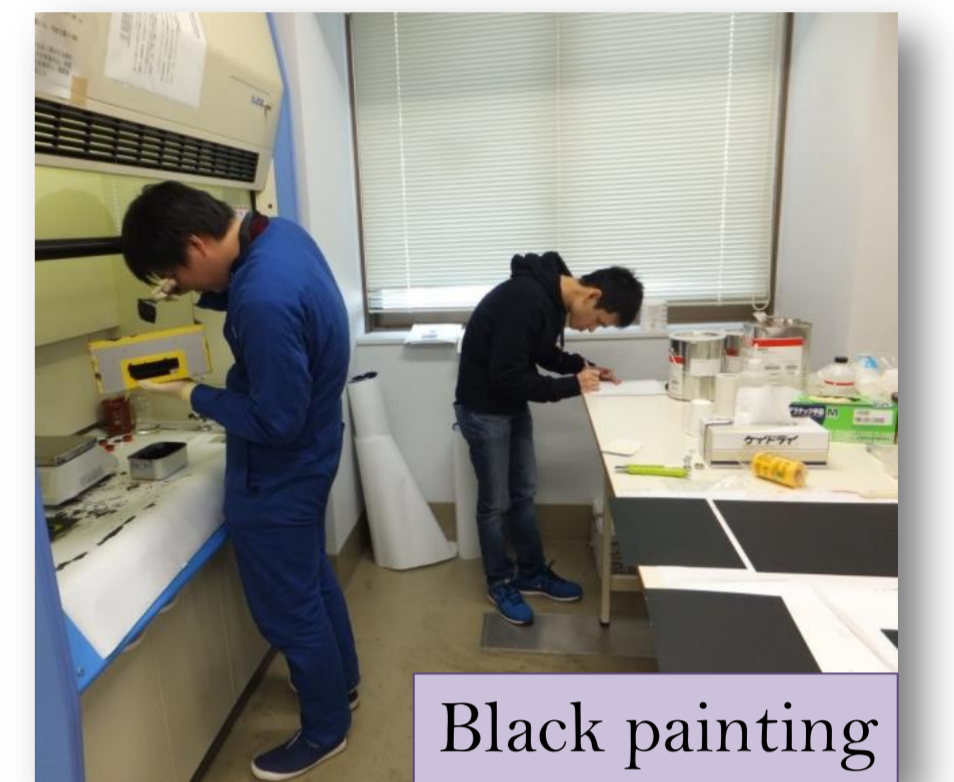
HORYU-IV aims at acquiring on orbit data of discharge phenomena occurring on high voltage solar array to deepen our **understanding of satellite charging**, to contribute to the **reliability improvement of current space systems**, and to positively contribute to the **realization of future high power space systems**.

Project Team



Interdisciplinary and international semi-pro team

HORYU-IV Team is composed of a total of **47 members** including faculty from the Laboratory of Spacecraft Environment Interaction Engineering, researchers, contractor, and students. Among the 47 members, there are **30 students and 17 faculty and staff**. The team particularities are its international and interdisciplinary dimensions. All members included, there are **18 countries** represented in the team and students major encompasses **4 different fields of engineering**: integrated system, electrical and electronic, mechanical and control, and civil and architectural engineering.



Missions Overview

Main mission – Discharge acquisition experiment

The objectives are to measure, on orbit, current waveform of discharges occurring on solar arrays, and photography discharge events to identify the ignition point. If successfully executed, acquisition of these data, on orbit, will be a **world premiere!**

<p>Secret Ink Study of polymer film degradation in space environment by taking photographs (substrate below polymer film is silver coated and upon oxidation, it will become darker and darker)</p>	<p>Earth Photography Camera Use of two CMOS modules to capture photographs of the Earth upon external user request</p>				<p>Double Langmuir Probe Measurement of plasma density and temperature while discharges occur</p>	<p>Electrons Emitting Film Verification, on orbit, of the possibility to emit electrons when mission dedicated film is biased to -300V relatively to the surrounding plasma</p>
<p>High Photo-voltaic Power Generation Generation of high photo-voltaic power to bias dedicated solar cells at -300V for on orbit evaluation of discharge mitigation methods (film-covered or coated solar cells)</p>	<p>Discharge induced Degradation Verification, on orbit, of whether discharge occurring on solar arrays can result in a decrease of their output power efficiency or not</p>	<p>Digi-singer Pre-programmed songs are processed on-board the satellite using vocal synthesizer before their download to the ground using UHF. All people around the world could enjoy "space music"!</p>	<p>Vacuum Arc Thruster Demonstration of trigger-less thruster technology that uses high photo-voltaic power for its ignition instead of a booster circuit</p>	<p>Photo-electrons Current Measurement Measurement, on orbit, of photo-electrons current from metallic and insulator surfaces using the AMO spectrum</p>		

Expected Outcomes

- ★ **World premiere** of on orbit acquisition of discharges current waveform and image
- ★ Use of data for ISO11221 "Spacecraft charging induced electrostatic discharge test methods" revisions
- ★ Improvement of satellite reliability by improving ground testing
- ★ Contribution to the development of research on spacecraft charging
- ★ **Capacity building** by contributing to emerging countries space program
- ★ Fostering of space utilization to the young generation through **outreach activities**
- ★ **Global resource development** through "Project Based Learning" involving Japanese and foreign students

